ABSTRACT

COUNSELING AND HUMAN DEVELOPMENT

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THE INFLUENCE OF GENDER AND ANXIETY ON MATHEMATICS PERFORMANCE

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The purpose of this study was to investigate the effect of the interference of mathematics anxiety on college students assigned to remediation classes and to determine low anxiety and gender influence on mathematics performances. The instruments used in this study consisted of a questionnaire for collecting a wide range of demographic information as well as other data relative to mathematics preparation in career plans. The Mathematics Anxiety Scale (MAS) was administered to assess feelings of anxiety, dread, nervousness, and associated body symptoms related to anxiety during mathematics, and a Pre-Test/Post-Test to measure mathematics performance for both male and female students assigned to remediation classes.

An Analysis of Variance with three factors (group treatment, gender, pre/post measures) was calculated and only the repeated measure was found to be significant.

Anxiety tended to significantly decrease between the pre and post measurements while performance increased significantly between pre and post measurements.

None of the complex interactions between gender, performance, and anxiety were significant. In fact, there were no significant differences among the three groups and none between male and female genders.

THE INFLUENCE OF GENDER AND ANXIETY ON MATHEMATICS PERFORMANCE

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CHAPTER ONE

INTRODUCTION

According to most psychiatrists, the major source of anxiety is tension which affects the conscience (or superego), an internal censor that starts developing quite early in life. As the children mature, they either accept and internalize the standards of significant persons, or reject some of those standards and substitute others in their place. Adolescents eventually acquire a system of their own which includes rights and wrongs. When the internal censor clashes with the individual's unconscious desires and impulses, their personality is, in a sense, divided, and a feeling of apprehension or tension or inner restlessness occurs.[1] Although the conscience takes over much of the approval-disapproval function formerly held by parents, teachers, and other influential adults, it can never eliminate the human being's very real need to be approved by others. The influence of this source of anxiety varies with each individual, some people being less able than others to lose their early strong dependency needs.

Arising from one's personal strivings to survive and to maintain and assert one's being, anxiety must be confronted as an inevitable part of the human condition.

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[1]R. May and I. Yalom, "Existential Psychotherapy," in Current Psychotherapies, eds. R. J. Corsini and D. Wedding, 4th ed. (New York: Basic Books, Inc., 1989), 368-404.

Existential therapists differentiate between normal and neurotic anxiety, and see anxiety as a potential source of growth. Normal anxiety is an appropriate response to an event being faced. Further, this kind of anxiety does not have to be repressed and can be used as a motivation to change. "Normal" anxiety is experienced in the face of such realities as illness, old age and death.[2] Some feelings of apprehension are probably always present whenever an individual moves from a sheltered situation to a new and unknown one, and whenever genuine values, love, freedom, equality, and self-respect are threatened, a state of anxiety is inevitable. Neurotic anxiety, in contrast, is out of proportion to the situation. It is typically out of awareness, and it tends to immobilize the person. Because one could not survive without some anxiety, it is not the therapeutic task to eliminate normal anxiety. Being psychologically healthy entails living with as little neurotic anxiety as possible while accepting and struggling with normal anxiety that is a part of living.[3]

Anxiety has been defined as an unpleasant state of tension which indicates the presence of some danger to the organism, or as the apprehensive tension or uneasiness which stems from anticipation of imminent danger, in which the

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[2]G. Corey, Theory and Practice of Counseling and Psychotherapy (California: Brook/Cole Publishing Company, 1991), 183-194.

[3]Ibid., 183.

source is largely unknown or unrecognized. However it may be described, the unpleasantness of anxiety is invariably stressed.[4] Subjectively uncomfortable and painful, anxiety not only warns the individual that something is wrong, but goads him into seeking out the source of danger so that it can be eliminated. It is clear that there is a characteristic lowering of intellectual control, attention, and concentration in overly anxious individuals. In studies designed to elucidate the relationship of anxiety to the performance of problem solving, as well as to the basic I.Q., Sarason[5] applied a variety of tests to elementary school children. The interference of high anxiety, which was noted, appeared at all levels of intelligence. The child who scored high on the anxiety scales manifested greater interference in problem-solving than his or her peers who scored low despite the fact both scored the same on an intelligence test.

The effect of anxiety and tension in reducing learning efficiency has been demonstrated both in situations of experimentally induced stress and in anxiety induced by unspecified sources. It was found that, with most adult subjects, the presence of clinical anxiety significantly

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[4]G. O. Gabbard, Psychodynamic Psychiatry in Clinical Practice (Washington: American Psychiatric Press, 1990), 199-221.

[5]S. B. Sarason, Anxiety in Elementary School Children (New York: Wiley, 1960), 159-187.

decreased scores on the Koh Block Design Test, which examines the patient's ability for discovering patterns, analyzing form, and generally perceiving the relation of the "whole to the part". Also, these observers noted that maze learning was consistently slower under anxiety conditions.[6]

The role of anxiety is particularly prominent in individual character formation and personality development. The uneasiness and apprehension aroused by the disapproval of parents, often bring about changes in a child's behavior. In both children and adults, levels of anxiety within the individual's capacity to cope with it are conducive to learning and growth. Anxiety is frequently a strong motivating force in decision-making and its unpleasantness pushes the individual toward the resolution of some inhibiting impasse caused by internal conflicts.[7] Anxiety can cause disjunctive and pathologic behavior. It is, in fact, probably at the root of most neurotic and psychotic illness. Man unconsciously employs various mechanisms when faced with unpleasant emotions of anxiety. These lead to the formation of symptoms, such as phobias, somatic conversions, and dissociative reactions. Thus, the symptoms which develop psychogenetically in emotional illness are,

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[6]G. O. Gabbard and J. C. Namiah, "Multiple Determinants of Anxiety in a Patient with Borderline Personality Disorder," Bull Menninger Clin. 49 (1985): 161-172.

[7]Ibid., 160.

ultimately, to be considered as the results of defensive efforts against anxiety.[8]

Many students are described as test anxious. The test anxious student is one who has self-depreciatory attitudes, anticipates failure in the test situation in the sense that he will not meet the standards of performance of others, and experiences the situation as unpleasant.

Test anxiety can also be described as the anticipation of some unpleasant threat which is related to a situation that is perceived as a test. A test can be equated by the anxious person, giving oral presentations in front of a class, working problems on a chalkboard or being evaluated on the basic of an objective examination.

The causes of test anxiety vary with the individual student. Test anxiety can be a learned behavior, that is, the result of expectations of parents, teachers, or significant others in the child's life. It can be an association of good grades with personal worth or it can be a fear of being alienated by parents, family, or friends because of poor performance or imperfect academic ability. Another cause of test anxiety can stem from a feeling of a lack of control and inability to change one's present life situation. Mathematics anxiety is related in that it

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[8]H. P. Laughlin, Neuroses in Clinical Practice (Philadelphia: Saunders, 1956), 251.

measures the knowledge and performance of mathematics ability, regardless of the method of evaluation.

Based on the researcher's experience as a mathematics professor, many students have fears when doing anything, mathematically. This fear may be described as mathematics anxiety. For some students, mathematics anxiety consist of feelings of self-doubt concerning their mathematics abilities.

Studies have shown that succeeding in mathematics is more often determined by one's attitude and feelings toward the subject. Most anxiety appears to arise in mathematics classes due to deficiencies in basic mathematics and poor study skills.

According to Richardson and Suinn,[9] mathematics anxiety is a feeling of tension and anxiety that interferes with the manipulation of numbers and mathematical problem solving in ordinary life and academic situations. Research has shown that many people of diverse backgrounds express a fear and/or dislike of mathematics.

Also, mathematics anxiety has been viewed as being related to test anxiety. The worry and emotional components proposed for test anxiety have even been supported in a preliminary fashion with mathematics anxiety. Mathematics anxiety involves feelings of tension and stress that

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[9]F. C. Richardson and R. M. Suinn, "The Mathematics Anxiety Rating Scale," Journal of Counseling Psychology 19 (1972): 551-554.

interfere with the solving of mathematical problems and manipulation of numbers in varied academic or daily life situations.

Research on gender differences with regard to mathematics anxiety and mathematics performance has, generally, found that college women, as compared to college men, have higher mathematics anxiety, take fewer mathematics courses, and score lower on mathematics performance test. Females in far greater numbers than males have sought help with their mathematics anxiety problems. Bander and Betz[10] reported that mathematics anxiety was a greater source of gender discrepancy than were other anxiety measures on difficult mathematics tasks.

It has often been said that contemporary culture makes mathematics success a male attribute. Nobody is born mathematics-anxious, with limited mathematics abilities, but society often punishes women who do well in mathematics, and depreciates those who do not do well by telling them that women are not mathematically inclined. Studies have shown that there are no differences in mathematics learning ability for males and females in elementary and secondary

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[10]R. Banders and N. E. Betz, "The Relationship of Sex Role to Trait and Situationally Specific Anxiety Types," Journal of Research on Personality 15 (1981): 312-322.

schools, and that college students do not perceive mathematics as a masculine-oriented occupation.[11]

Remediation of mathematics skills is a difficult and complex enterprise at the college level. Since it is essential that all students take at least college algebra on the undergraduate level, it has been observed that before many of these students can perform, mathematics remediation is required. Sometimes students are required to take two or more remedial courses before taking college algebra. Since a strong mathematics background is needed for nearly three-quarters of the majors offered at most colleges and universities and for at least two-thirds of the more lucrative occupations, the enterprise is of enormous personal and social importance. Those students who fail to develop skills in mathematics suffer restricted options in selecting college majors and careers.[12]

Although mathematics anxiety has received a great deal of attention in journals and publications, the question still remains: Are colleges responding to those students that are mathematics-anxious by providing the tools necessary for reducing mathematics anxiety or will these students continue to live with the fear that mathematics

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[11]M. M. Llabre and E. Suarez, "Predicting Mathematics Anxiety and Course Performance in College Performance in College Women and Men," Journal of Counseling Psychology 32 (1985): 283-287.

[12]L. Sells, "Mathematics: A Critical Filter," Science Teacher 45 (1982): 28-29.

just is not for everybody? A sociocultural explanation of gender differences in mathematics anxiety and performance suggests that women who continue to pursue mathematics might be more equivalent to their male peers in terms of attitude toward mathematics than are female college students in general.

Statement of the Problem

The problem involved in the study was that of investigating the effect of mathematical anxiety on students enrolled in mathematical developmental courses in mathematics. Mathematics anxiety has been found to be related to mathematics achievement. Many studies have been conducted to show that high achievement in mathematics by students is related to low anxiety from grade school through college. Also, research supported the fact that a teacher's behavior makes a difference in student achievement. One method of effective teaching behavior which is termed "direct instruction", requires that a substantial amount of class time be devoted to active teaching. The teacher presents the goal of each lesson and makes presentations illustrating how to do the assigned work which is evaluated frequently.

Mathematics anxiety is a promising construct for understanding avoidance behavior in mathematics, particularly in women. Mathematics anxiety affects mathematics performance and fosters mathematics avoidance.

Since anxiety inhibits work, the student will stop studying mathematics in order to avoid anxiety.

Gender differences in mathematics anxiety have been investigated in many studies with different results. Several studies have shown no statistically significant differences in mean levels of anxiety between men and women. While some researchers have implied innate differences between the sexes in mathematical ability, many more have found a variety of socioculture variables to be related both to mathematical achievement in enrollment in advanced mathematics courses. Others have reported that females have higher levels of mathematics anxiety than males. The affective and attitudinal variables which have been discovered to predict this mathematics-related behavior include confidence in learning mathematics, mathematics anxiety, and the perceived usefulness in mathematics. Since males take more mathematics courses than females, sex differences might be a confounding difference due to prior courses taken. The nature of sex differences needs further study since mathematics fear in women is an important problem in education.

Purpose of the Study

The purpose of this study was to investigate the effects of mathematics anxiety on male and female students enrolled in remedial courses in mathematics. The following hypotheses were tested:

H_1: There will be no statistically significant difference between the test anxiety factors affecting male and female subjects enrolled in mathematical developmental studies classes.

H_2: There will be no statistically significant difference between the performance of male and female students enrolled in mathematical classes when anxiety is reduced.

The majority of these students have been placed in developmental studies due to poor performances on the college placement examination. Developmental Studies mathematics are designed for those students entering college with little or no mathematical background. Students who are simply deficient in mathematics skills can be remediated. However, those students with legitimate fears and anxiety have, perhaps, never experienced little success in mathematics. The level of anxiety for each gender was determined upon successfully completing work assignments.

Significance of the Problem

Since there is little research interest in the treatment of mathematics anxiety, very little is known about the nature of this problem. Research is needed to establish the severity of the problem and data involving demographic and background correlations of mathematics anxiety. These important data would help to identify those students in need of remediation.

On the contrary, there is a long history of research on the relationship between gender and attitudes toward mathematics. Although mathematics anxiety usually occurs around adolescence, it is significant that many educational psychologists and mathematics educators feel that mathematics anxiety can be overcome or at least minimized. Researchers believe that learning can occur, regardless of age, sex, or past experience, with proper guidance and support.

Research Question

The research questions investigated in this study are listed below:

1. Is anxiety a factor influencing differences in the performance of males and females in developmental mathematics?

2. Do developmental interventions in mathematics reduce mathematics anxiety difference between genders.

Definition of Terms

The significant terms, used in this investigation, will have the following meaning:

Anxiety Feelings: Those data revealed by subjects in the Mathematics Anxiety Scale.

Test Anxiety: Data about the worries and arousal states students experience before and during test-taking

activities as revealed by their performance on The Coping with Tests Inventory.

Mathematics Anxiety: Feelings of tension and stress that interfere with the manipulation of numbers and mathematical problem solving in ordinary life and academic situations.

Demographic Data: These data consist of chronological age, sex, marital status, living arrangement, parents' occupation, level of education, mathematics classes taken and overall average.

Relaxation Techniques: Exercises used in helping students cope during stressful times.

Gender Differences: Comparing the performance and anxiety levels of male and female students in mathematics.

Mathematics Self-Efficacy: Expectation of one's ability to perform well.

Normal Anxiety: Feelings of stress caused by realities such as illness, old age and death.

Neurotic Activity: Out of proportion to the situation; out of awareness and tends to immobilize the person.

Hypotheses

In carrying out the purpose of this study, the following hypotheses were tested at the .05 level of confidence.

H_1: There will be no statistically significant difference in test anxiety factors between males and females in the performance of mathematics in developmental studies classes.

H_2: There will be no statistically significant difference in the performance of males and females in developmental studies mathematics classes when mathematics anxiety is reduced.

CHAPTER TWO

REVIEW OF LITERATURE

Mathematics Anxiety and Group Performance Among College Males and Females

Mathematics anxiety and performance represent anxiety-related concerns that are of considerable interest to counseling psychologists, and constitute a particularly fertile area for testing hypotheses about cognitive interventions in counseling.[1] Mathematics anxiety involves "feelings of tension and stress that interfere with the manipulation of numbers and the solving of mathematical problems in a variety of situations".[2] Mathematics anxiety is, certainly, not the only factor affecting mathematics performance. Performance has often been found to vary as a function of sex with men typically out performing women.[3]

Siegel, Galassi, and Ware[4] believed that to increase mathematics performance, practitioners should, first,

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[1]N. E. Betz, "Prevalence, Distribution, and Correlate of Mathematics Anxiety in College Students," Journal of Counseling Psychology 25 (1978): 441-448.

[2]Richardson and Suinn, "The Mathematics Anxiety Rating Scale: Psychometric Data," 551-554.

[3]E. Fennema and J. Sherman, "Sex Related Differences in Mathematics Achievement, Spatial Visualization and Affective Factors," American Educational Research Journal 19 (1976): 51-71.

[4]R. G. Siegel, J. P. Galassi, and W. B. Ware, "A Comparison of Two Models for Predicting Mathematics Performance: Social Learning Verses Mathematics Aptitude-Anxiety," Journal of Counseling Psychology 32 (1985): 531-538.

concentrate on interventions to increase mathematics skills, and, as a by-product, a reduction of mathematics anxiety may occur. Llabre and Suarez[5] suggested that women who seek treatment for this anxiety are likely to profit from treatment that focuses specifically on situations that involve mathematics.

Although the literature is replete with studies illustrating "male superiority" in mathematics performance and quantitative abilities, until recently, little attention has focused on why females typically receive lower scores. A study by Fennema and Sherman[6] examined sex differences in mathematics performance of female and male students in grade ninth through twelfth. Aiken[7] reviewed the literature concerning the influence of attitudes and other effective variables on mathematics performance and noted that most such variables are correlated with mathematics performance. Tobias[8] discusses mathematics anxiety as stemming from a culture that makes mathematics ability a masculine attribute, that punishes women for doing well in

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[5]Llabre and Suarez, "Predicting Mathematics Anxiety and Course Performance in College Women and Men," 283-287.

[6]Fennema and Sherman, "Sex Related Differences in Mathematics Achievement, Spatial Visualization and Affective Factors," 31.

[7]L. R. Aiken, "Update on Attitudes and Other Affective Variables in Learning Mathematics," Review of Education Research 46 (1976): 293-311.

[8]S. Tobias, "Mathematics Anxiety: What It Is and What Can Be Done About It?" Ms., September 1976, 56-59.

mathematics, and that soothes the slower mathematics learner by telling her she does not have a mathematical mind.

Goldman and Hewitt[9] demonstrated the influence of mathematics performance as measured by the mathematics scores of the Scholastic Aptitude Test (SAT) on mathematics related major choices in college. Sells[10] found that without three-and-a-half years of high school mathematics, entering students would have three quarters of the college majors closed to them before they even began their college study.

Gender Differences With Regard to Mathematics Anxiety

Gender differences in mathematics anxiety have been investigated in many studies. Several studies have reported no statistically significant differences in mean level of anxiety between men and women, whereas others have shown females to report higher levels of mathematics anxiety than males.[11] Richardson and Woolfolk[12] suggested that "the

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[9]R. D. Goldman and B. N. Hewitt, "The Scholastic Aptitude Test Explains Why College Men Major in Science More Often Than Women," Journal of Counseling Psychology 23 (1976): 50-54.

[10]Sells, "Mathematics--A Critical Filter," 28-29.

[11]L. R. Brush, "A Validation Study of the Mathematics Anxiety Rating Scale (MARS)," Educational and Psychological Measurement 38 (1978): 485-490.

[12]F. C. Richardson and R. L. Woolfolk, "Mathematics Anxiety," in Test Anxiety Theory, Research, and Application, ed. I. G. Sarason (Hillsdale, N.J.: Erlbaum, 1990), 275-288.

amount of interaction with mathematics, not the variable of sex, predicts levels of mathematics anxiety in college students". Rounds and Hendel[13] studied the relationship between mathematics anxiety and the Fennema-Sherman Mathematics attitude scales in female participants in a mathematics anxiety treatment program and found that mathematics was related to other attitudinal variables. When discussing mathematics-related career choices, gender differences in mathematics achievement must be addressed. A long-standing controversy still reigns over the possible genetic origins of the often-observed male superiority in mathematics; and, in fact, this controversy has recently revived. Fennema[14] reported that when mathematics background was controlled for, something that few studies on gender differences in mathematics have done, few related mathematics achievement differences have been found. Betz and Hackett[15] found gender differences in mathematics self-efficacy to be correlated with gender differences in attitude toward mathematics and choice of

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[13]J. B. Rounds and D. D. Hendel, "Measurement and Dimensionality of Mathematics Anxiety," Journal of Counseling Psychology 27 (1980): 138-149.

[14]E. Fennema, "Sex Related Differences in Mathematics Achievement: Where and Why," in Women and the Mathematical Mystique, eds. L. H. Fox, L. Brody, and D. Tobin (Baltimore: John Hopkins University Press, 1980), 14-27.

[15]N. E. Betz and G. Hackett, "The Relationship of Mathematics Self-Efficacy Expectation to the Selection of Science-Based College Majors," Journal of Vocational Behavior 23 (1983): 329-345.

mathematics-related college majors. The finding of sex typing of mathematics as a male domain on the part of male and female students further supported the notion that sex socialization plays a major role in mathematics-related behavior. Also, it was stated that the effects of sex role socialization on mathematics achievement influence attitude toward mathematics or election of mathematics courses in high school.

Popular discourse would have one believe that the gender gap has decreased in most areas that once plagued education. However, in the area of mathematics study, research has, repeatedly, found that males are far more likely than females to participate in and excel at the highest level of mathematics study. This persistent gender difference has been the focus of much research over the last fifteen years.[16]

While some researchers have implied innate differences between the sexes in mathematical ability, many more have found a variety of sociocultural variables to be related both to mathematics achievement and enrollment in advanced mathematics courses.[17] While these variables

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[16]S. F. Chipman and V. G. Thomas, "Women's Participation in Mathematics: Outlining the Problem," in Women in Mathematics: Balancing the Equation, eds. S. F. Chipman, L. R. Brush and D. M. Wilson (Hillsdale, N.J.: Erlbaum, 1965), 134-147.

[17]J. Sherman, "Girls' and Boys' Enrollments in Theoretical Mathematics Courses: A Longitudinal Study," Psychology of Women Quarterly 5, no. 5 (1981): 681-689.

appear to exert a powerful influence on both mathematics persistence and achievement, they are not, readily, amenable to interventions that produce behavioral changes. Thus, it has become necessary to investigate those variables upon which the educational community may have some influence.

Fennema and Peterson[18] talked about a learning behavior as a possible explanation for gender-related differences in mathematics. The behavior that characterized autonomous learning behavior is viewed as a mediator between internal and external influences and performance on high level cognitive tasks. It is hypothesized to be the result of external and societal factors. There is a long history of research on the relationship between gender and attitude toward mathematics. Carey[19] found attitudes toward mathematics to be strongly related to performance and found that females performed less in mathematics and exhibited poorer attitudes toward the subject. Since Carey's research, many studies have found attitudes toward mathematics to be positively related to mathematics achievement.

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[18]E. Fennema and P. Peterson, "Autonomous Learning Behavior: A Possible Explanation of Gender-Related Differences in Mathematics," in Gender Influences in Classroom Interaction, eds. L. C. Wilkinson and C. B. Marrell (New York: Academic Press, 1985), 50-71.

[19]G. L. Carey, "Sex Differences in Problem-Solving Performances as a Function of Attitude Differences," Journal of Abnormal and Social Psychology 56 (1958): 256-260.

Mathematics Self-Efficacy

Mathematics anxiety involves feelings of tension and stress that interfere with the solving of mathematics problems and manipulation of numbers in varied academic or daily life situations. The increasing realization among counseling psychologists shows that our knowledge of women's vocational behavior and career development is inadequate, and has been accompanied by a dramatic increase in the empirical literature devoted to this topic.[20] In an attempt to fill this conceptual void, Hackett and Betz[21] have outlined a self-efficacy approach to women's career development. This approach stresses the role of cognitive-mediational factors, specifically, expectations of personal effectiveness or self-efficacy in career choice. It is beginning to receive some empirical support. Also, it was reported, in the first test of the self-efficacy model, that career related efficacy was related to the nature and range of career alternatives being considered by women and men.[22] Self-efficacy, with regard to mathematics, has been chosen as the topic of investigation in the present study because of the increasing importance of adequate preparation

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[20]L. F. Fitzgerald and J. O. Crites, "Toward a Career Psychology of Women: What Do We Know? What Do We Need To Know?" Journal of Counseling Psychology 27 (1980): 44-62.

[21]G. Hackett and N. E. Betz, "A Self-Efficacy Approach to the Career Development of Women," Journal of Vocational Behavior 18 (1981): 326-339.

[22]Ibid., 339.

in mathematics to a broad range of career options. Gender differences in mathematics preparation have been termed a "critical filter" in the career development of women and minorities.[23] Lack of mathematics preparation and consequent lower levels of mathematics achievement result in the premature closure of options, effectively serving to bar women and minorities from higher level, technological, and generally male-dominated occupations.[24]

Although much is known about the variables which are thought to influence mathematics achievement and mathematics career choices, the documented correlations among these variables do not allow strong statements about the causal relationships underlying them. Goldman and Hewett[25] have suggested that prior performance and achievement are the factors which are influenced by gender; and consequently, they directly influence mathematics-related major and career choices. Self-efficacy theory would predict that mathematics-related self-efficacy, as influenced by gender,

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[23]L. W. Sells, "The Mathematics Filter and the Education of Women and Minorities," in Women in the Mathematical Mystique, eds. L. H. Fox, L. Brody, and D. Tobin (Baltimore: John Hopkins University Press, 1980), 66-75.

[24]L. A. Fox, L. Brody, and D. Tobin, eds., Women and the Mathematics Mystique (Baltimore: John Hopkins University Press, 1980), 66-75.

[25]R. D. Goldman and B. N. Hewitt, "Scholastic Aptitude Test Explains Why College Men Major in Science More Often Than Women," Journal of Counseling Psychology 23 (1976): 50-54.

socialization, mathematics, and background, is more strongly predictive of mathematics major and career choice than the ability, mathematics background, or gender alone or in combination. Mathematics anxiety, according to the self-efficacy approach, is viewed as a consequence of high expectations with regard to analytical related career choices.

Reduction of Mathematics Anxiety

There are sources of stress that adolescents experience as they make the transition from childhood to adolescence. The physiological, psychological, and social changes can affect even the most intelligent and mature adolescent. As early as 1954, Gough delineated a condition she labeled metaphobia and sought to describe its causes and treatment. Others began to study this phenomenon and to recognize its significance to the population at large. While it appears that gender offers no immunity to the distress suffered by the mathematics anxious, researchers continue to view mathematics as a "filter" which serves to prevent many otherwise capable and talented individuals (especially women) from entering mathematics-related fields. Mathematics avoidance prohibits promotion and advancement to

managerial and administrative positions which necessitate the use of statistical and numerical data.[26]

Awareness of mathematics anxiety and its ramifications was limited to educators and mental health professionals. This increasing awareness, on the part of professionals and the general public, has led to efforts to deal with the problem. Various methods have been utilized. The process of desensitization is a common component. Researchers have shown that this type of treatment has been effective with many people. However, for those who do not respond to this procedure, there has been little hope of overcoming their problem.[27]

Also, cognitive behavior modification has been adapted to utilize the techniques of modeling, mental rehearsal of adaptive behavior via coping imagery, and attention to the covert mental process of the client in an attempt to accomplish greater behavioral change than desensitization alone appeared to achieve. Cognitive behavior modification has been successfully applied to other anxiety related conditions.

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[26]L. R. Aiken and R. M. Dreger, "The Identification of Number Anxiety in College Population," The Journal of Education Research 57 (1957): 344-351.

[27]J. R. Hyman, "Systematic Desensitization of Mathematics Anxiety in High School Students: The Role of Mediating Responses, Imagery, Emotionality, and Expectancy," (Ph.D. diss., Wayne State University, 1973), Dissertation Abstracts International, 34, 11-13, 1974, 5680-5681.

Cue-Controlled Relaxation

Cue-controlled relaxation was selected as one of the treatments based on earlier research, suggesting it is an effective strategy for reducing test anxiety.[28] The study treatment was included to examine the effects that improving specific mathematics skills might have on reducing anxiety and enhancing performance. The combined treatment was included because prior test anxiety research has indicated that multicomponent programs may be more effective than single component intervention strategies.[29]

Summary

Mathematics anxiety has been discussed as one of the factors contributing to poor performance, especially among women. Many programs have been developed for its treatment, but more research needs to be conducted concerning its correlates. Remediation of mathematics skills is a difficult and complex task at the college level. Individuals who fail to develop skills in mathematics suffer restricted options in selecting college majors and careers.

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[28]R. K. Russell, D. Miller, and L. Juen, "A Comparison Between Group Systematic Desensitization and Cue-Controlled Relaxation in the Treatment of Test Anxiety," Behavior Therapy 6 (1975): 172-177.

[29]G. J. Allen, "The Behavior Research of Test Anxiety: Recent Research and Future Trend," Behavior Therapy 3 (1972): 253-262.

CHAPTER THREE

METHODOLOGY

Quasi-experimental research techniques were utilized in this study. The students were administered three instruments (questionnaire, Mathematics Anxiety Scale and pre/post test examination). Research commenced on January 20, 1993 and terminated May 20, 1993. Research methods are detailed below.

Research Design

A quasi-experimental research design was used in this investigation. The effects of mathematical anxiety, on male and female subjects enrolled in mathematical classes in developmental studies, were investigated.

A questionnaire, Mathematical Anxiety Scale, a Coping with Tests Inventory, College Placement Examination, and pre- and post-test examinations were administered to the subjects.

Setting

The setting selected for this study was Macon College, located in Macon Georgia. This setting was chosen because of willingness to cooperate with the researcher and the convenience of its locale. Macon College is one of thirty-four public colleges and universities governed by the Board of Regents of the University System of Georgia. Located ninety miles south of Atlanta and ten miles west of

downtown Macon, the one hundred sixty-seven acre campus serves a metropolitan population of more than two-hundred fifty thousand.

Subject Pool

The subject pool for this study consisted of a select number of students placed in Developmental Studies due to poor performance on College Placement Examinations (CPE). All subjects were attending Macon College during the Spring quarter 1993.

Sample

The sample was obtained from the subject pool. The subjects were randomly selected from the subject pool. Additionally, all subjects were willing and available to participate at the time of the study.

Instruments

A questionnaire was used to gather a range of demographic information as well as data relative to mathematics preparation and career plans. A Mathematics Anxiety Scale was used to assess feelings of anxiety, dread, nervousness, and associated body symptoms. Pre- and post-tests were given to measure performance for both male and female students. The Coping with Test Inventory was used as a treatment for Group II respondents.

Instrument Description

The instruments used for this study consisted of five sections, Section A through E. Section A contained the demographic data; Section B contained information about College Placement Examination; Section C contained information about the pre- and post tests; Section D contained the Mathematics Anxiety Scale (MAS); Section E contained information on Coping With Tests. Each section is described below.

Section A: Demographic Section

This section contained 12 closed-ended questions designed to obtain information which describes the background of all subjects. Information, such as age, sex, marital status, living arrangement, parents occupation, level of education, mathematics classes taken, and overall average, was obtained in this section.

Section B: College Placement Exam (CPE)

The College Placement Examination consisted of a forty item multiple-choice test designed to evaluate certain mathematical skills of students where high school transcripts and the Scholastic Aptitude Test indicate possible deficiencies. The objectives of the test were:

1. to assess the level of competency in mathematics for beginning college students

2. to provide standards and uniform testing instruments to be used systemwide
3. to assist in placing students in remedial mathematics classes
4. to assist in determining when a student is ready for college level course work (exit exam)

Section C: Pre-Test and Post-Test

Pre- and Post-tests in Mathematics were given at the beginning and the end of the session to all study subjects. The purpose of these tests was to measure mathematics performance for both male and female students taking remediation courses. Each group was given the same examinations and the results were compared.

Section D: Mathematics Anxiety Scale (MAS)

The Mathematics Anxiety Scale (MAS), one of nine scales constituting the Fennema-Sherman Mathematics Scales[1] was intended to assess feelings of anxiety, dread, nervousness, and associated body symptoms related to anxiety during mathematics. This scale was designed for administration to high school students, but several items were rewritten for college students. Twelve items were used on the Fennema-Sherman scale, ten were selected to measure mathematics anxiety in college students. Item responses

[1]Fennema and Sherman, "Sex Related Differences in Mathematics Achievement, Spatial Visualization and Affective Factors," 51-71.

were obtained on a 5-point Likert scale; responses ranged from one (strongly disagree) to five (strongly agree).

Section E: Coping with Tests

The Coping with Tests Inventory[2] was used as a treatment for Group II respondents. This inventory was developed after extensive work with high school and college students. Also, it is based on the work of many researchers who have over the years developed questionnaires designed to measure test anxiety. This inventory views test anxiety as a combination of too much worry and arousal before and during tests. The twenty questions ask the survey respondent to estimate the frequency and intensity of their anxiety and arousal by placing them on a scale from "almost never" to "almost always". The results of the test will put the survey respondent into one of the three categories: first, those students who have serious problems in taking test; second, students whose difficulties in taking tests are not quite so serious as those of the first group; and third, those students who appear to have few difficulties, yet, who may still benefit from further sharpening of their relaxation and concentration skills.

The attitude inventory is useful in indicating where an individual stands relative to other students at the school level. The questions are straight forward, asking

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[2]Charles Spielberger, Coping with Tests (California: Consulting Psychologists Press, 1986), 1-16.

whether in test situations the respondent feels confident and relaxed or uneasy, and whether extraneous thoughts interfere with the respondent's ability to concentrate while taking tests.

Also, the Coping with Tests program comes with a relaxation tape. After completing the relaxation training, one should feel confident that he or she can, with the test, relax both physically and mentally within a few minutes.

The Cope and Relaxation computer program exposes the user, gradually, to specific test situations that may make them feel anxious. The task was to work on feeling physically and mentally relaxed at the same time. This procedure was called systematic desensitization. The program requires the user to use his or her imagination as the writer did with the relaxation tape.

Procedures

There were three study periods for this research. They included the pre-research period, research period, and the post-research period. The procedures are listed below in chronological order.

Pre-Research Period

Procedure 1

Through the cooperation of my co-workers and the department chairperson of developmental studies, permission was obtained for me to conduct this study.

Procedure 2

The students were given a college placement examination (CPE). Those students scoring less than 75% were required to take a developmental studies mathematics class. The students selected to participate in this study were assigned to three intermediate algebra classes at Macon College during the Spring quarter.

Research Period

Procedure 3

A twelve week study was conducted to investigate mathematics anxiety for male and female students taking intermediate algebra at Macon College. All students filled out a questionnaire requesting information on demographic characteristics and prior course work completed in mathematics. The three groups, which were called Group I, Group II, and Group III, were identified. Group I and Group II, which were the experimental groups, were treated with traditional relaxation techniques which were designed to desensitize feelings of stress and anxiety. Group III, which was the control group, was not given any specific treatment. Subjects were randomly selected by this researcher. All three groups were administered the Mathematics Anxiety Scale, and a Pre-Test at the beginning of this research.

Procedure 4

Group I was taught relaxation techniques and general problem-solving procedures. Group II was given The Coping With Test treatment which is a computerized program that consisted of a progressive series of test-taking exercises that incorporated skills in improving performance and decreasing anxiety. Group III which was the controlled group, did not have access to any treatment.

Procedure 5

Gender differences were examined separately for mathematics anxiety, test anxiety, and test performance. Algebriac concepts were presented in each of these classes using the textbook, Intermediated Algebra for College Students.[3] Instruction and individual attention were provided in the three groups. The students were assigned homework after each class meeting. Of the fifty-minutes session, fifteen minutes of that time were devoted to reviewing homework. The anxiety reduction portion dealt with past experience and feelings regarding mathematics. Techniques were reinforced in helping students change their feelings about mathematics competence and their ability to control their anxious reactions.

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[3]R. Aaufmann, V. Barker and J. Lockwood, Intermediated Algebra for College Students (Boston: Houghton Mifflin Company, 1990), 1-260.

Procedure 6

At the end of the session, each group was given the final examination. The participants were thanked by the researcher for participating in this study.

Post-Research Period

Procedure 7

All data had been collected. The study is now terminated.

Data Collection

All study data were collected by the researcher.

Data Analysis

Statistical tests included frequency tabulations, t-test, the Pearson Product Moment Correlation and the three factor analysis of variance with repeated measures on the last factor. Also, the analyses included several graphs and charts that were analyzed by inspection.

Human Subjects Contract

No human subjects contract was needed because direct services were not provided for the sample.

CHAPTER FOUR

RESULTS

Presented in this chapter are the results of the analyses and their relevance to the hypotheses.

The research questions in this study were:

1. Is anxiety a factor in the differences in the performance of males and females in developmental studies mathematics?

2. Does developmental intervention in mathematics reduce mathematics anxiety difference between the genders.

Hypotheses

H_1: There is no statistically significant difference in test anxiety factors between males and females in the performance of mathematics in developmental studies classes.

H_2: There is no statistically significant difference in the performance of males and females in developmental studies mathematics classes when mathematics anxiety is reduced.

Preliminary Analysis

Members of three groups at Macon College served as the subjects in the three independent groups. The students were measured on the Mathematics Anxiety Scale before and after instruction and were also measured on a Mathematics Performance Task before and after instruction.

A preliminary attempt was made to demonstrate a relationship between mathematics anxiety and mathematics performance in preparation for covariance analysis and multivariate analysis. However, the Pearson Product-Moment correlation coefficients, calculated between the anxiety and performance scores of males were $r = -.04$ and for females the correlations were $r = -.05$. In the absence of a statistically significant correlation between the measures of performance and anxiety, no attempt was made to perform covariance or multivariate analyses.

Differences between the means were analyzed using a three factor Analysis of Variance with repeated measures on the last factor. As the ANOVA tables from that analysis show, the only variables that demonstrated statistically significant differences ($p < .01$) between any of the conditions were the repeated measures for anxiety and performance. Neither the gender variable, the group variable, nor any of the interactions approached statistical significance at the .05 level.

Main Analysis

The three frequency polygons for each group were confirmed by inspecting the results of the Analysis of Variance. Both males and females in all three groups scored lower the second time on the anxiety measure and higher the second time on the performance measure. The differences were statistically significant beyond the .01 level for both

TABLE 1

THREE FACTOR ANALYSIS OF VARIANCE
REPEATED MEASURES ON LAST FACTOR

Math Anxiety Measure			
Source	Df	Mean Square	f-ratio
Methods	2	5.4	0.67
Gender	1	0.26	1.1
Methods X Gender	2	17.2	0.71
Error between	42	24.4	
Repeated Msr (R)	1	52.5	9.7*
Method X R	2	2.3	0.42
Gender X R	1	6.5	1.2
3 way interaction	2	3.2	0.59
Error within subj	42	15.3	

*p < .01

TABLE 2

THREE FACTOR ANALYSIS OF VARIANCE
REPEATED MEASURES ON LAST FACTOR

Math Performance Measure			
Source	Df	Mean Square	f-ratio
Methods	2	23	0.38
Gender	1	25	0.42
Methods X Gender	2	40.5	0.67
Error between	42	60.3	
Repeated Msr (R)	1	894	58.5*
Method X R	2	8.8	0.57
Gender X R	1	8.8	0.57
3 way interaction	2	9.7	0.63
Error within subj	42	15.3	

*p < .01

TABLE 3

DATA FOR THREE CHARTS (FREQ. POLYGONS)

	Group I		
	Pre	Post	
Male	2.8	1.1	(anxiety)
Female	0.4	0.4	
Male	14.9	21.1	(performance)
Female	19.1	23.5	
	Group II		
	Pre	**Post**	
Male	2	0.8	(anxiety)
Female	0.3	0.3	
Male	17.2	24.1	(performance)
Female	15.5	20.8	
	Group III		
	Pre	**Post**	
Male	3	1.6	(anxiety)
Female	1.6	0.6	
Male	13.7	21.5	(performance)
Female	14.2	20.6	

kinds of measurements. The means shown in the frequency polygons represent all subjects in the study rather than the randomly selected eight subjects from each group. The outcome of the analysis was not affected by whether all subjects or only eight subjects in each group were used.

TABLE 4

GENDER DIFFERENCES BY T-TEST

Pre Performance		Post Performance		Pre Anxiety		Post Anxiety	
Males	Females	Males	Females	Males	Females	Males	Females
9	14	12	13	7	-1	4	0
14	8	18	14	1	2	0	2
18	14	19	25	0	7	1	5
23	32	25	35	-2	2	2	-2
18	13	32	20	3	1	1	0
16	19	30	21	4	-5	0	-3
13	24	19	22	4	3	-2	-2
8	27	14	39	5	1	3	-1
11	28	17	31	5	-2	-3	0
11	13	31	21	-9	2	-5	0
12	14	12	22	-6	4	-4	0
24	35	25	35	3	3	2	3
13	24	26	27	-1	-6	1	-7
16	17	28	18	3	6	2	4
22	16	19	20	6	-2	1	-3
11	22	19	26	8	-6	6	-4
13	5	20	11	2	-2	1	2
13	13	15	16	6	6	8	0
21	11	35	16	1	0	2	-1
16	12	23	19	0	-6	-3	-3
28	8	33	11	3	4	-1	1
30	24	35	18	7	-6	5	-4
14	15	18	19	1	0	-3	2
15	26	21	29	3	2	0	4

TABLE 4 (Continued)

	Pre Performance		Post Performance		Pre Anxiety		Post Anxiety	
	Males	Females	Males	Females	Males	Females	Males	Females
	12	14	21	26	6	4	7	-1
	15	12	21	21	6	-3	3	-3
	9	14	21	29	5	-3	-2	3
	18	21	33	25	-3	-1	-5	-1
	16	12	17	23	3	-7	-2	-3
	21	13	22	13	0	1	-3	-6
	7	18	20	32	2	3	8	6
	10	132	21	19	7	7	6	9
avg	15.53	15	22.56	19	2.50	12	0.94	1
sdev	5.61	14	6.55	26	3.84	8	3.66	4
n	32	18	32	27	32	7	32	2
		21		28		3		4
		13		29		-1		-3
		15		14		0		0
		12		13		-1		-3
		11		17		0		-6
		12		16		-1		-1
		14		19		1		0
		12		18		3		5
avg		15.72		22.37		3.38		1.90
sdev		6.29		7.02		6.19		6.31
N		43		43		43		43

TABLE 4 (Continued)

	Pre Performance		Post Performance		Pre Anxiety		Post Anxiety	
	Males	Females	Males	Females	Males	Females	Males	Females
t =	-0.14		0.12		-0.76		-0.83	
df =	73		73		73		73	
mean =	15.53	15.72	22.56	22.37	2.50	3.38	0.94	1.90

None of the t-tests reached a value of 1.0 and we needed almost a value of 2.0 for significance at the .05 level. So, none were significant. The means and standard deviations for each of the eight groups of scores were included in Table 4.

Males went up in performance by seven (7) points between pre- and post-measures and females went up in performance by just under seven (7) points. Males went down in anxiety by about 1.5 points and females went down in anxiety by 1.48 points.

Summary

The three figures, attached to this summary, show the major findings of the research. An Analysis of Variance with three factors (group treatment, gender, pre- and post-measures) was calculated and only the repeated measure was found to be statistically significant. As the charts show, anxiety tended significantly to decrease between the pre- and post-measurements while performance increased significantly between pre- and post-measurements.

None of the complex interactions between gender, performance, and anxiety was statistically significant. In fact, there were no statistically significant differences among the three groups and none between males and females. Interestingly, females tended to have somewhat less anxiety than males overall and tended (not significantly) to out-score them on the performance measure.

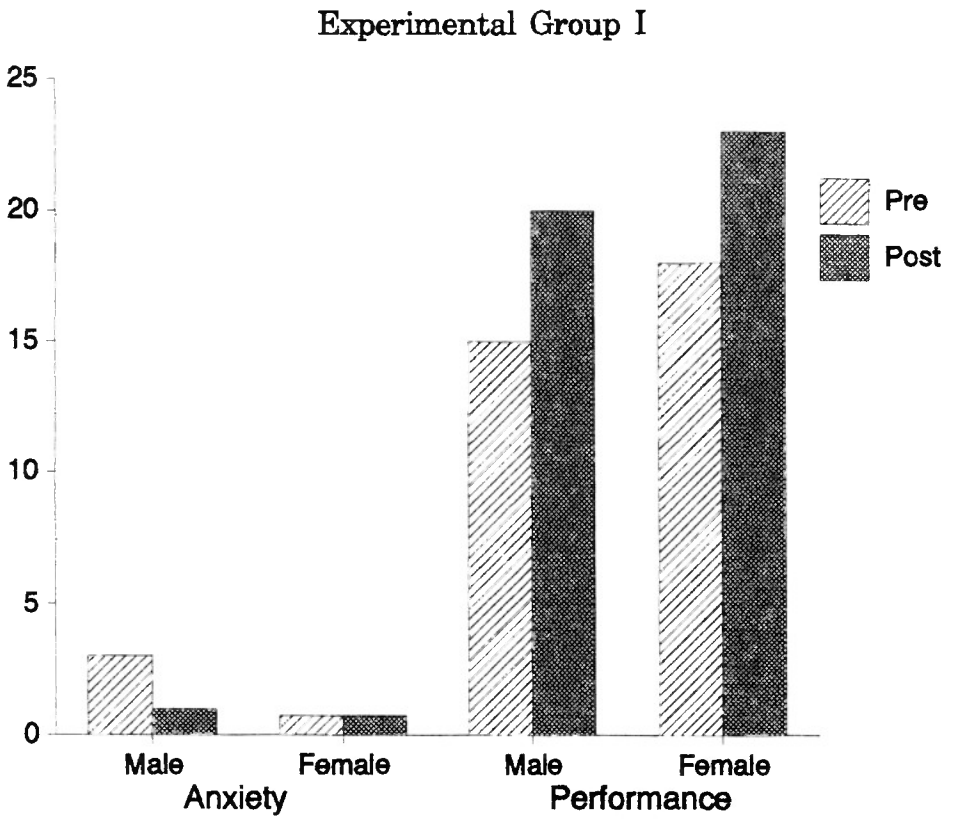


Figure 1: Analysis of Variance with Three Factors

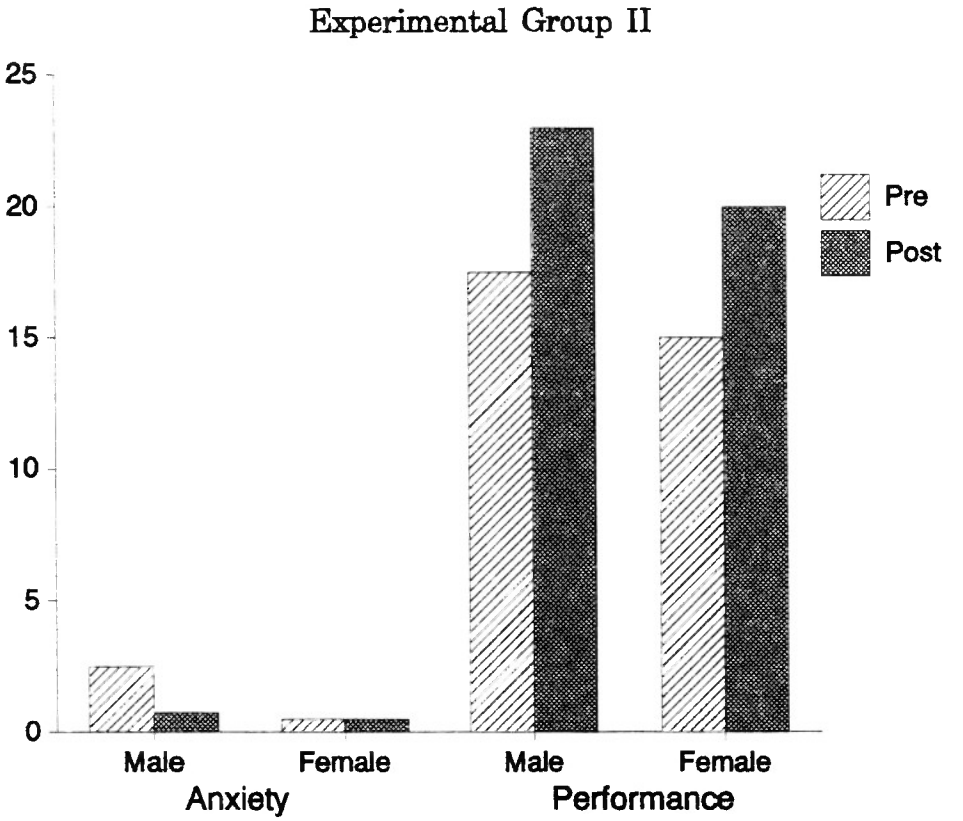


Figure 2: Analysis of Variance with Three Factors

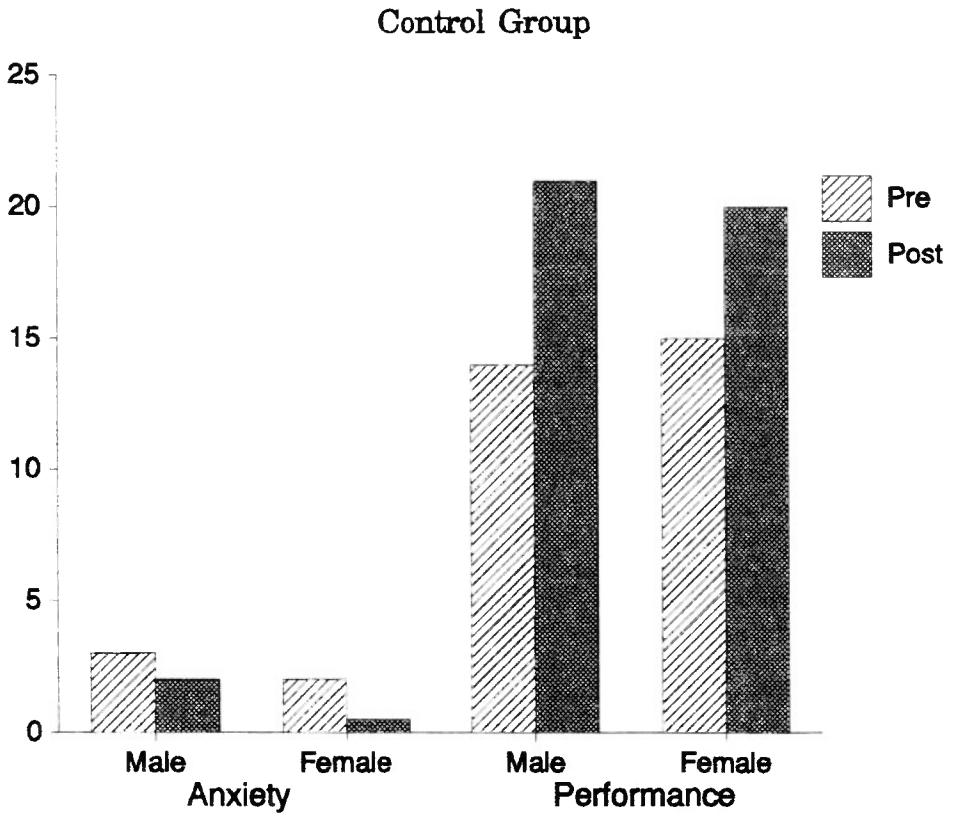


Figure 3: Analysis of Variance with Three Factors

The data are quite clear in this study, as the charts and analysis show. The differences between pre- and post-tests, for both anxiety and performance, were highly statistically significant and differences in gender and between groups did not approach statistical significance.

Summary of Findings

A summary of statistical findings revealed the following:

1. The F-ratio was 9.7 (df = 42) for an analysis of variance for repeated measures on the last factor.

2. The F-ratio was 58.5 (df = 42) for three factor analysis of variance for repeated measures on the last factor.

CHAPTER FIVE

FINDINGS, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Recapitulation of Research Design

This study was designed to investigate the anxiety students might experience while studying mathematics in mathematical developmental classes. The research was designed to find answers to the following questions:

1. Is anxiety a factor influencing differences in the performance of male and female students in developmental mathematics?

2. Do developmental interventions in mathematics reduce mathematics anxiety differences between male and female students?

Findings

The only statistically supported conclusion that can be drawn from the study showed that mathematics anxiety, as measured by the Mathematics Anxiety Scale, decreased upon repeated administrations of the test. Mathematics performance, as measured by the task used in this study, increased upon repeated administrations of the tasks. Both of these are reasonable findings based upon the common outcome that anxiety tends to decrease and performance tends to increase with practice on a measure. This finding is important in that it tends to validate the methods that were used. The measurements were sensitive enough to detect a

commonly reported result and it may then be expected that the measurements should have been sensitive enough to detect differences in gender and teaching methods if any were present. Since the f-ratios for those differences barely exceeded a value of 1.0 on any of the tests it is unlikely that accidental circumstances would have obscured real differences that might have been lost. In fact, these conditions tend to confirm the assumption that neither gender nor teaching methods was in any way effective variables in this study.

Conclusions

The assumption that males should score higher on mathematical tasks than females has been challenged in this study. It is possible that the technique of selecting males and females from three groups at Macon College may have contributed to the failure of males to show superior mathematics performance. The possibility that males do not perform better in mathematics than females under the conditions of this study deserves investigation. Some light might be shed on the question by an inspection of mathematics grades of males and females in a broader student population at Macon College.

The absence of a gender difference in mathematics anxiety scores is also interesting. Since the test was sufficiently sensitive to measure decreases in anxiety over time it should also have been sensitive to gender

differences, although none was recorded. Again, anxiety scores from a larger student population at Macon College might be collected and compared with mathematics performances as measured by grades in mathematics courses. If those measures also failed to show anxiety and performance differences related to gender, the finding would be at variance with commonly held expectations.

Limitations

Since anxiety has been widely reported to decrease over time and performance has been widely reported to increase with practice, it is probably not necessary to limit the generalization of that finding in this study. However, the lack of a performance difference between males and females has not been widely reported and may be due to the limitations of this study. The major limitation would be the restriction of subject selection at Macon College where females tend to out number males.

The failure to find a statistically significant mathematics anxiety difference between males and females may also be a function of the student population at Macon College. The method of subject selection in this study would prevent any generalization of that finding beyond the groups in which it was observed.

The difference between the groups (teaching methods) consistently showed the lowest f-ratios of any other statistical comparisons made in this study. This finding

would seem to discourage further investigation of the effectiveness of those teaching methods.

Recommendations

Differences in anxiety and in the performance between males and females can be measured directly in a single session with student subjects. It would seem prudent to establish these differences before exerting any additional effort to manipulate those differences, such as in the application of different teaching methods.

The failure to find a significant relationship between anxiety and performance is also frustrating in this study. This relationship has been reported consistently since Yerkes and Dodson first reported it in the 1920's. It has been known since then as the "Yerkes Dodson Law." Anxiety is well understood to be an impediment to performance on complex tasks, but if differing levels of anxiety were responsible for the different levels of performance in this study the effect was obscured. In view of this, it is necessary to assume that some variables other than anxiety were having the major effect on performance differences.

APPENDICES

APPENDIX A

STUDENT QUESTIONNAIRE

Circle the alphabet that represent the choice that comes nearest to your situation. The answers you give will be held in confidence and can in no way be used against you. Please answer as honestly as you possibly can.

DEMOGRAPHICS

1. Your age is ___ years old.
   a. 17-25
   b. 26-35
   c. 36-45
   d. 46-55
   e. above 55

2. Your sex is
   a. male
   b. female

3. Your present marital status is
   a. single
   b. married
   c. divorced or separated
   d. widowed

4. Your present arrangement is
   a. live with parents
   b. live with husband
   c. live with wife
   d. live as single head of household with children
   e. live alone

5. How would you list the occupation of your father?
   a. skilled
   b. unskilled
   c. semi-skilled
   d. professional

6. Which of the following is (was) the occupation of your mother?
   a. skilled
   b. unskilled
   c. semi-skilled
   d. professional

7. What is your father's highest level of formal education?
   a. elementary school
   b. high school
   c. one (1) or two (2) years of college
   d. vocational school
   e. college (4-year degree or above)

8. Which of the following represent your mother's highest level of formal education?
   a. elementary school
   b. high school
   c. one (1) or two (2) years of college
   d. vocational school
   e. college (4-year degree or above)

9. Which level represent the range of your parents' total income?
   a. less than $5,000
   b. $5,000 - $9,999
   c. 10,000 - $19,999
   d. $20,000 - $29.999
   e. more than $30,000

10. How many mathematics books would you say were around your parents' home?
   a. less than 5
   b. 5-10
   c. 11-15
   d. 16-20
   e. more than 20

11. Which mathematics courses did you take in high school?
   a. basic mathematics
   b. algebra I
   c. algebra I and geometry
   d. algebra I, geometry, and algebra II
   e. advanced mathematics classes above algebra II

12. What was your overall average in high school?
   a. A
   b. B
   c. C
   d. D
   e. others

APPENDIX B

FREQUENCY TABULATION FROM STUDENT QUESTIONNAIRE

GROUP I

Total Respondents: 25
Student Questionnaire
Subgroup Respondents: 25

Response Set: A = 17-25
B = 26-35
C = 36-45
D = 46-55
E = above 55

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
1. Your age is ___ years old.										
Total f:	12	8	5				25	1.72	0.79	2.0
Total %:	48.0	32.0	20.0							

Response Set: A = male
B = female

Response Weight: A = 01
B = 02

	A	B	Miss.	N	Mean	SD	MDN
2. Your sex is							
Total f:	8	17		25	1.68	0.48	2.0
Total %:	32.0	68.0					

Response Set: A = single
B = married
C = divorced/separated
D = widowed

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN
3. Your present marital status is									
Total f:	13	9	3			25	1.60	0.71	1.0
Total %:	52.0	36.0	12.0						

Response Set: A = live with parents
B = live with husband
C = live with wife
D = single head w/kids
E = live alone

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

4. Your present living arrangement is

Total f:	12	7	3	3		25	1.88	1.05	2.0
Total %:	48.0	28.0	12.0	12.0					

Response Set: A = skilled
B = unskilled
C = semi-skilled
D = professional

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN

5. How would you list the occupation of your father?

Total f:	5	3	12	5	20	2.35	0.88	3.0
Total %:	25.0	15.0	60.0					

6. Which of the following is (was) the occupation of your mom?

Total f:	7	3	7	2	6	19	2.21	1.08	2.0
Total %:	36.8	15.8	36.8	10.5					

Response Set: A = elementary school
B = high school
C = 1 or 2 years college
D = vocational school
E = college (4-year or >)

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

7. The highest level of formal education of your father?

Total f:	1	13	8	1	2	25	2.60	0.96	2.0
Total %:	4.0	52.0	32.0	4.0	8.0				

8. The highest level of formal education of your mother?

Total f:	1	11	6	3	3	1	24	2.83	1.13	2.5
Total %:	4.2	45.8	25.0	12.5	12.5				

Response Set:
A = < $5,000
B = $5,000 - $9,999
C = $10,000 - $19,999
D = $20,000 - $29,999
E = > $30,000

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

9. What is (was) the range of your parents' total income?

Total f:	2	1	3	9	9	1	24	3.92	1.21	4.0
Total %:	8.3	4.2	12.5	37.5	37.5					

Response Set:
A = less than 5
B = 5 - 10
C = 11 - 15
D = 16 - 20
E = more than 20

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

10. How many math books were around your parents' home?

Total f:	24	1					25	1.04	0.20	1.0
Total %:	96.0	4.0								

Response Set:
A = basic math
B = algebra I
C = algebra I & geometry
D = algebra I, II & geometry
E = above algebra II

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

11. What math classes did you take in high school?

Total f:	10	8	4	3			25	2.00	1.04	2.0
Total %:	40.0	32.0	16.0	12.0						

Response Set: A = A
B = B
C = C
D = D
E = others

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

12. What was your overall average in high school math?

Total f:	2	8	11	3	1	25	2.72	0.94	3.0
Total %:	8.0	32.0	44.0	12.0	4.0				

GROUP II

Total Respondents: 21
Student Questionnaire
Subgroup Respondents: 21

Response Set: A = 17-25
B = 26-35
C = 36-45
D = 46-55
E = above 55

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

1. Your age is ___ years old.

Total f:	10	9	2			21	1.62	0.67	2.0
Total %:	47.6	42.9	9.5						

Response Set: A = male
B = female

Response Weight: A = 01
B = 02

	A	B	Miss.	N	Mean	SD	MDN

2. Your sex is

Total f:	10	11				21	1.52	0.51	2.0
Total %:	47.6	52.4							

Response Set: A = single
B = married
C = divorced/separated
D = widowed

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN

3. Your present marital status is

Total f:	13	5	3		21	1.52	0.75	1.0
Total %:	61.9	23.8	14.3					

Response Set: A = live with parents
B = live with husband
C = live with wife
D = single head w/kids
E = live alone

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

4. Your present living arrangement is

Total f:	9	5	4	3	21	2.05	1.12	2.0
Total %:	42.9	23.8	19.0	14.3				

Response Set: A = skilled
B = unskilled
C = semi-skilled
D = professional

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN

5. How would you list the occupation of your father?

Total f:	3	2	10	2	4	17	2.65	0.93	3.0
Total %:	17.6	11.8	58.8	11.8					

6. Which of the following is (was) the occupation of your mom?

Total f:	8	2	2	4	5	16	2.13	1.31	1.5
Total %:	50.0	12.5	12.5	25.0					

Response Set:
A = elementary school
B = high school
C = 1 or 2 years college
D = vocational school
E = college (4-year or >)

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
7. The highest level of formal education of your father?										
Total f:	3	8	3	1	5	1	20	2.85	1.46	2.0
Total %:	15.0	40.0	15.0	5.0	25.0					
8. The highest level of formal education of your mother?										
Total f:	3	10	4	2	2		21	2.52	1.17	2.0
Total %:	14.3	47.6	19.0	9.5	9.5					

Response Set:
A = < $5,000
B = $5,000 - $9,999
C = $10,000 - $19,999
D = $20,000 - $29,999
E = > $30,000

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
9. What is (was) the range of your parents' total income?										
Total f:	1	2		2	16		21	4.43	1.21	5.0
Total %:	4.8	9.5		9.5	76.2					

Response Set:
A = less than 5
B = 5 - 10
C = 11 - 15
D = 16 - 20
E = more than 20

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
10. How many math books were around your parents' home?										
Total f:	21						21	1.00	0.00	1.0
Total %:	100.0									

Response Set:
A = basic math
B = algebra I
C = algebra I & geometry
D = algebra I, II & geometry
E = above algebra II

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

11. What math classes did you take in high school?

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
Total f:	7	6	6	2			21	2.14	1.01	2.0
Total %:	33.3	28.6	28.6	9.5						

Response Set:
A = A
B = B
C = C
D = D
E = others

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

12. What was your overall average in high school math?

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
Total f:	2	5	10	3	1		21	2.81	0.98	3.0
Total %:	9.5	23.8	47.6	14.3	4.8					

GROUP III

Total Respondents: 25
Student Questionnaire
Subgroup Respondents: 25

Response Set:
A = 17-25
B = 26-35
C = 36-45
D = 46-55
E = above 55

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

1. Your age is ___ years old.

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
Total f:	20	3	2				25	1.28	0.61	1.0
Total %:	80.0	12.0	8.0							

Response Set: A = male
B = female

Response Weight: A = 01
B = 02

	A	B	Miss.	N	Mean	SD	MDN
2. Your sex is							
Total f:	10	15		25	1.60	0.50	2.0
Total %:	40.0	60.0					

Response Set: A = single
B = married
C = divorced/separated
D = widowed

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN
3. Your present marital status is									
Total f:	19	4	2			25	1.32	0.63	1.0
Total %:	76.0	16.0	8.0						

Response Set: A = live with parents
B = live with husband
C = live with wife
D = single head w/kids
E = live alone

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
4. Your present living arrangement is										
Total f:	16	5	2	1		1	24	1.50	0.83	1.0
Total %:	66.7	20.8	8.3	4.2						

Response Set: A = skilled
B = unskilled
C = semi-skilled
D = professional

Response Weight: A = 01
B = 02
C = 03
D = 04

	A	B	C	D	Miss.	N	Mean	SD	MDN

5. How would you list the occupation of your father?

Total f:	5	5	10	1	4	21	2.33	0.91	3.0
Total %:	23.8	23.8	47.6	4.8					

6. Which of the following is (was) the occupation of your mom?

Total f:	5	6	4	4	6	19	2.37	1.12	2.0
Total %:	26.3	31.6	21.1	21.1					

Response Set: A = elementary school
B = high school
C = 1 or 2 years college
D = vocational school
E = college (4-year or >)

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

7. The highest level of formal education of your father?

Total f:	6	7	5	2	4	1	24	2.63	1.41	2.0
Total %:	25.0	29.2	20.8	8.3	16.7					

8. The highest level of formal education of your mother?

Total f:	1	14	5		3	2	23	2.57	1.08	2.0
Total %:	4.3	60.9	21.7		13.0					

Response Set: A = < $5,000
B = $5,000 - $9,999
C = $10,000 - $19,999
D = $20,000 - $29,999
E = > $30,000

Response Weight: A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN

9. What is (was) the range of your parents' total income?

Total f:	4	3	3	3	9	3	22	3.45	1.60	4.0
Total %:	18.2	13.6	13.6	13.6	40.9					

Response Set:
A = less than 5
B = 5 - 10
C = 11 - 15
D = 16 - 20
E = more than 20

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
10. How many math books were around your parents' home?										
Total f:	18	3			2	2	23	1.48	1.16	1.0
Total %:	78.3	13.0			8.7					

Response Set:
A = basic math
B = algebra I
C = algebra I & geometry
D = algebra I, II & geometry
E = above algebra II

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
11. What math classes did you take in high school?										
Total f:	9	7	6	2		1	24	2.04	1.00	2.0
Total %:	37.5	29.2	25.0	8.3						

Response Set:
A = A
B = B
C = C
D = D
E = others

Response Weight:
A = 01
B = 02
C = 03
D = 04
E = 05

	A	B	C	D	E	Miss.	N	Mean	SD	MDN
12. What was your overall average in high school math?										
Total f:	4	8	9	2	1	1	24	2.50	1.02	2.5
Total %:	16.7	33.3	37.5	8.3	4.2					

APPENDIX C

MATHEMATICS ANXIETY SCALE

Name_____

Age _____ Sex: F ___ M ___

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feeling best.

		Not At All	Somewhat	Moderately So	Very Much So
1.	Math doesn't scare me at all.	1	2	3	4
2.	It wouldn't bother me at all to take more math courses.	1	2	3	4
3.	I haven't usually worried about being able to solve math problems.	1	2	3	4
4.	I usually never have gotten shook up during a math test.	1	2	3	4
5.	I usually have been at ease during math tests.	1	2	3	4
6.	I usually have been at ease in math classes.	1	2	3	4
7.	Mathematics usually makes me feel uncomfortable.	1	2	3	4

		Not At All	Somewhat	Moderately So	Very Much So
8.	Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	1	2	3	4
9.	I get a sinking feeling when I think of trying hard math problems.	1	2	3	4
10.	My mind goes blank and I am unable to think clearly when working mathematics.	1	2	3	4
11.	A math test would scare me.	1	2	3	4
12.	Mathematics makes me feel uneasy and confused.	1	2	3	4

APPENDIX D

PRE-TEST/POST-TEST EXAMINATION

DIRECTIONS

1. DO NOT WRITE ON THIS TEST PAPER.

2. On the answer sheet, write your name, section number, instructor, and the test number which appears at the top of this page.

3. Do all work on the scratch paper which your instructor has provided.

4. Each item has exactly one correct answer. Use a pencil to mark the space on the answer sheet which corresponds to the letter of your choice. CAUTION: If you use an eraser, erase completely.

DO NOT WRITE ON THIS TEST

1. $(2 - 5)^3$ is equal to:

   A. -9

   B. -27

   C. 9

   D. -117

   E. 117

2. $(3)\{[-31 - (-3)] \div (7)\}$

   A. -12

   B. 12

   C. $\frac{-102}{7}$

   D. $\frac{102}{7}$

   E. 1

3. $\frac{x^{77}}{x^7}$ is equal to:

   A. x^{84}

   B. x^{10}

   C. x^{70}

   D. x^{11}

   E. 11

4. $-2xy^2(5xy - 4x^2y^3)$ is equal to

   A. $-10x^2y^3 + 8x^3y^5$

   B. $20x^3y^3 - 16x^4y^5$

   C. $-2x^4y^4$

   D. $40x^4y^6$

   E. $-2x^4y^5$

5. $(x^4)^3$ is equal to:

   A. x^{12}

   B. x^{43}

   C. x^7

   D. x^{64}

   E. x

6. $-7 + 3 \times 8$ is equal to:

   A. 12

   B. 4

   C. -32

   D. 17

   E. -80

7. If $7\frac{3}{5}$ is decreased by $4\frac{4}{5}$ the result is:

   A. $11\frac{2}{5}$

   B. $2\frac{4}{5}$

   C. $12\frac{2}{5}$

   D. $3\frac{1}{5}$

   E. none of these

8. If 43 is diminished by .034, the difference is:

   A. 43.034

   B. 42.966

   C. 42.066

   D. 43.966

   E. none of these

9. $5\frac{1}{3} \times 2\frac{1}{4}$ is equal to:

   A. 12

   B. $\frac{3}{4}$

   C. $\frac{4}{3}$

   D. $\frac{64}{27}$

10. The product of $\frac{5}{49}$ and $\frac{14}{55}$ is:

   A. $\frac{2}{11}$

   B. $\frac{2}{77}$

   C. $\frac{5}{77}$

   D. $\frac{19}{2695}$

   E. $\frac{19}{104}$

11. 27% of $380 is:

A. $1026

B. $102.60

C. $10.26

D. $380.27

E. none of these

12. Which of the following is true?

I. $7^2 = 49$

II. $-7^2 = 49$

III. $(-7)^2 = 49$

A. I only

B. II only

C. I and II only

D. I and III only

E. I, II, and III

13. -9 - 13 is equal to:

A. -117

B. -107

C. +4

D. -22

E. 22

14. If $2.3x = -5.29$, then x is equal to:

    A. -5.29

    B. -7.59

    C. 2.3

    D. -2.3

    E. -2.99

15. Consider the statement: "five times the sum of a number x and 2 is equal to seven plus twice x." Write this statement in symbolic form.

    A. $5x + 2 = 7 + 2x$

    B. $5x + 2 = 2(7 + x)$

    C. $5(x + 2) = 7 + 2x$

    D. $5(x + 2) = 2(7 + x)$

    E. none of these

16. Write $\frac{5}{8}$ as a decimal:

    A. .16

    B. 1.6

    C. .625

    D. 6.25

    E. none of these

17. $x^{77} \cdot x^{7}$ is equal to:

    A. x^{84}

    B. x^{777}

    C. x^{70}

    D. x^{539}

    E. none of these

18. If $10x + 6 - 2x = 7x + 5 - 3x$, then x is equal to:

A. $-\frac{1}{2}$

B. $-\frac{1}{4}$

C. $\frac{11}{4}$

D. 4

E. -4

19. If $\frac{1}{5}x + \frac{1}{3}x = -16$, then x is equal to:

A. 16

B. -2

C. -16

D. -30

E. -240

20. $(-3y)(-2y^7)^3$ is equal to:

A. $6y^8$

B. $-24y^{22}$

C. $24y^{22}$

D. $-6y^{22}$

E. $216y^{24}$

21. $(3a + b)(a - b)$ is equal to:

A. $3a^2 - b^2$

B. $3a^2 - 2ab - b^2$

C. $3a^2b^2$

D. $3a^2 + 2ab - b^2$

E. $3a^2 + 4ab + b^2$

22. The sum of $\frac{8}{21}$ and $\frac{9}{14}$ is:

A. $\frac{17}{35}$

B. $\frac{1}{2}$

C. $\frac{43}{42}$

D. $\frac{17}{42}$

E. none of these

23. If $7\frac{1}{3}$ is the dividend and $1\frac{5}{6}$ is the divisor, the quotient is:

A. $\frac{1}{4}$

B. 22

C. 4

D. $9\frac{1}{6}$

E. none of these

24. $\left(\frac{-2}{3}\right)^4$ is equal to:

A. $\frac{-8}{3}$

B. $\frac{8}{3}$

C. $\frac{16}{81}$

D. $-\frac{16}{81}$

E. $\frac{16}{3}$

25. If $x = 2$ and $y = -1$, then $(x - y)^2 - xy$ is equal to:

A. 3

B. -1

C. 0

D. 5

E. 11

26. If $7(x - 2) = 4(1 - x)$, then x is equal to:

A. $\frac{3}{4}$

B. $\frac{11}{18}$

C. $\frac{18}{11}$

D. 6

E. -6

27. $\frac{-20a^5b^3 + a^3b}{a^3b}$ is equal to:

A. $-20a^2b^2$

B. $-21a^2b^2$

C. $-20a^2b^2 + 1$

D. $-19a^5b^3$

E. $-20a^2b^2 + a^3b$

28. $\frac{-6a^5b^2}{24a^4b^7}$ is equal to:

A. $\frac{-4a}{b^5}$

B. $\frac{a}{-4b^5}$

C. $\frac{1}{-4ab^5}$

D. $-4ab^5$

E. $\frac{ab^5}{18}$

29. $\frac{-36}{56} \div \frac{-27}{49}$ is equal to:

A. $\frac{243}{686}$

B. $\frac{1}{2}$

C. $\frac{7}{6}$

D. $-\frac{1}{2}$

E. $-\frac{7}{6}$

30. Which of the following sets is equal to the set of integers?

A. {. . . , -3, -2, -1, 0, 1, 2, 3, . . .}

B. {3, -2, -1, 0, 1, 2, 3}

C. {0, 1, 2, 3, . . .}

D. {1, 2, 3, . . .}

E. none of these

31. If S = {s|s is a real number between 7 and 11}, which of the following is true:

A. $7\frac{1}{2} \subset S$

B. $7\frac{1}{2} \in S$

C. $7\frac{1}{2} \notin S$

D. $8 \subset S$

E. none of these

32. If $5x + 3 < 15x + 3$, then

A. $x < 0$

B. $x > -\frac{2}{3}$

C. $x > 0$

D. $x < \frac{2}{3}$

E. $x < -\frac{2}{3}$

33. Which of the following belongs to the solution set of the inequality $x \leq -4$?

A. 0

B. -4

C. -3

D. 1

E. none of these

34. If $\frac{1}{7}x + \frac{1}{3}x < -3$ then

A. $x > \frac{-3}{10}$

B. $x < \frac{-3}{10}$

C. $x > -3$

D. $x < -3$

E. $x < \frac{-63}{10}$

35. $2.781 \div .103$ is equal to:

A. 27

B. .027

C. .03

D. .04

E. none of these

36. $5 + x[6 - (4 + x)]$ is equal to:

A. $7x + 1$

B. $5 + 2x - x^2$

C. $x^2 + 2x + 5$

D. $2x + 7$

E. $10x + 5x^2$

37. $(3x^2 + 8x - 35) \div (3x - 7)$ is equal to:

A. $3x + 8$

B. $x + 5$

C. $x - 5$

D. $x + 8x + 5$

E. $3x^2 + 5x - 28$

38. If $S = \{2, 4, 6, 8, 10\}$

$H = \{4, 6, 10\}$

$K = \{2, 8\}$ then

A. $S \subset H$

B. $S \subset K$

C. $H = K$

D. $H \cup K = S$

E. $H \cap K = S$

39. If S = {2, 3, 4, 5, 6, 7} which one of the following is <u>not</u> a subset of S?

A. {5}

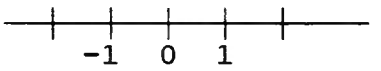
B. {5, 2}

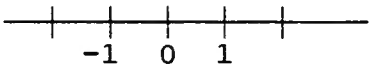
C. {7, 2, 6}

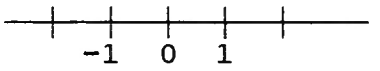
D. {25}

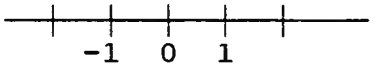
E. none of these

40. Which of the following is the graph of $x \leq -1$?

A. 

B. 

C. 

D. 

E. none of these

APPENDIX E

PERFORMANCE DATA

PERF #2

I	Male		I	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	9	12	1	14	13
2	14	18	2	8	14
3	18	19	3	14	25
4	23	18	4	32	35
5	18	19	5	13	20
6	16	25	6	19	21
7	13	32	7	24	22
8	8	30	8	27	39
			9	28	31
			10	13	21
			11	14	22
			12	35	35
			13	24	27
			14	17	18
			15	16	20
			16	22	26
			17	5	11
	14.88	21.13		19.12	23.53
	4.97	7.22		8.31	7.95

II	Male		II	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	11	17	1	13	16
2	11	31	2	11	16
3	12	12	3	12	19
4	24	25	4	8	11
5	13	26	5	24	18
6	16	28	6	15	19
7	22	19	7	26	29
8	11	19	8	14	26
9	13	20	9	12	21
10	13	15	10	14	29
11	21	35	11	21	25
12	16	23			
13	28	33			
14	30	35			
	17.21	24.14		15.45	20.82
	6.58	7.51		5.70	5.79

III	Male		III	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	14	18	1	12	23
2	15	21	2	13	13
3	12	21	3	18	32
4	15	21	4	13	19
5	9	21	5	15	19
6	18	33	6	14	26
7	16	17	7	18	27
8	21	22	8	21	28
9	7	20	9	13	29
10	10	21	10	15	14
			11	12	13
			12	11	17
			13	12	16
			14	14	19
			15	12	18
	13.70	21.50		14.20	20.87
	4.27	4.33		2.81	6.20

3 way ANOVA, rptd msr, equal n, 1st 8 subjects each

	Source	Df	Ms	f	
A	Groups	2	23.0	0.4	
B	Male/female	1	25.0	0.4	
	A x B	2	40.5	0.7	
	error btwn	42	60.3		
C	pre/post	1	894.3	58.5	<.01
	A x C	2	8.8	0.6	
	B x C	1	8.8	0.6	
	A x B x C	2	9.7	0.6	
	error within	42	15.3		

Summary of Sums

	Male		Female	
	Pre	Post	Pre	Post
G1	119	169	151	189
G2	120	177	123	154
G3	120	174	124	187

MATHEMATICS ANXIETY SCALE DATA

MAS #2

I	Male		I	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	7	4	1	-1	0
2	1	0	2	2	2
3	0	1	3	7	5
4	-2	2	4	2	-2
5	3	1	5	1	0
6	4	0	6	-5	-3
7	4	-2	7	3	-2
8	5	3	8	1	-1
			9	-2	0
			10	2	0
			11	4	0
			12	3	3
			13	-6	-7
			14	6	4
			15	-2	-3
			16	-6	-4
			17	-2	2
	2.75	1.13		0.41	-0.35
	2.92	1.89		3.87	3.04

II	Male		II	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	5	-3	1	6	0
2	-9	-5	2	0	-1
3	-6	-4	3	-6	-3
4	3	2	4	4	1
5	-1	1	5	-6	-4
6	3	2	6	0	2
7	6	1	7	2	4
8	8	6	8	4	-1
9	2	1	9	-3	-3
10	6	7	10	-3	3
11	1	2	11	-1	-1
12	0	-3			

II	Male		II	Female	
Sbj	Pre	Post	Sbj	Pre	Post
13	3	-1			
14	7	5			
	2.00	0.79		-0.27	-0.27
	4.84	3.68		4.03	2.57

III	Male		III	Female	
Sbj	Pre	Post	Sbj	Pre	Post
1	1	-3	1	-7	-3
2	3	0	2	1	-6
3	6	7	3	3	6
4	6	3	4	7	9
5	5	-2	5	1	1
6	-3	-5	6	8	4
7	3	-2	7	7	2
8	0	-3	8	3	4
9	2	8	9	-1	-3
10	7	6	10	0	0
			11	-1	-3
			12	0	-6
			13	-1	-1
			14	1	0
			15	3	5
	3.00	0.90		1.60	0.60
	3.13	4.72		3.83	4.42

3 way ANOVA, rptd msr, equal n, 1st 8 subjects each

	Source	Df	Ms	f	
A	Groups	2	5.4	0.670	n.s
B	Male/female	1	0.3	1.100	n.s
	A x B	2	17.2	0.710	n.s
	error btwn	42	24.4		
C	pre/post	1	52.5	9.700	<.01
	A x C	2	2.3	0.418	n.s
	B x C	1	6.5	1.200	n.s
	A x B x C	2	3.2	0.590	n.s
	error within	42	5.4		

Summary of Sums

	Male		Female	
	Pre	Post	Pre	Post
G1	22	9	10	-1
G2	9	0	4	-2
G3	21	-5	23	17

ALL DATA

I	Male				I	Female			
S#	Pre		Post		S#	Pre		Post	
1	9	7	12	4	1	14	-1	13	0
2	14	1	18	0	2	8	-2	14	2
3	18	0	19	1	3	14	7	25	5
4	23	-2	25	2	4	32	2	35	-2
5	18	3	32	1	5	13	1	20	0
6	16	4	30	0	6	19	-5	21	-3
7	13	4	19	-2	7	24	3	22	-2
8	8	5	14	3	8	27	1	39	-1
					9	28	-2	31	0
					10	13	2	21	0
					11	14	4	22	0
					12	35	3	35	3
					13	24	-6	27	-7
					14	17	6	18	4
					15	16	-2	20	-3
					16	22	-6	26	-4
					17	5	-2	11	2
	14.9	2.8	21.1	1.1		19.1	0.4	23.5	-0.4
	5.0	2.9	7.2	1.9		8.3	3.9	7.9	3.0

II	Male				II	Female			
S#	Pre		Post		S#	Pre		Post	
1	11	5	17	-3	1	13	6	16	0
2	11	-9	31	-5	2	11	0	16	-1
3	12	-6	12	-4	3	12	-6	19	-3
4	24	3	25	2	4	8	4	11	1
5	13	-1	26	1	5	24	-6	18	-4
6	16	3	28	2	6	15	0	19	2
7	22	6	19	1	7	26	2	29	4
8	11	8	19	6	8	14	4	26	-1
9	13	2	20	1	9	12	-3	21	-3
10	13	6	15	7	10	14	-3	29	3
11	21	1	35	2	11	21	-1	25	-1
12	16	0	23	-3					

II	Male				II	Female			
S#	Pre		Post		S#	Pre		Post	
13	28	3	33	-1					
14	30	7	35	5					
	17.2	2.0	24.1	0.8		15.5	-0.3	20.8	-0.3
	6.6	4.8	7.5	3.7		5.7	4.0	5.8	2.6

III	Male				III	Female			
S#	Pre		Post		S#	Pre		Post	
1	14	1	18	-3	1	12	-7	23	-3
2	15	3	21	0	2	13	1	13	-6
3	12	6	21	7	3	18	3	32	6
4	15	6	21	3	4	13	7	19	9
5	9	5	21	-2	5	15	1	19	1
6	18	-3	33	-5	6	14	8	26	4
7	16	3	17	-2	7	18	7	27	2
8	21	0	22	-3	8	21	3	28	4
9	7	2	20	8	9	13	-1	29	-3
10	10	7	21	6	10	15	0	14	0
					11	12	-1	13	-3
					12	11	0	17	-6
					13	12	-1	16	-1
					14	14	1	19	0
					15	12	3	18	-5
	13.7	3.0	21.5	0.9		14.2	1.6	20.9	0.6
	4.3	3.1	4.3	4.7		2.8	3.8	6.2	4.4

3 way ANOVA, rptd msr, equal n, 1st 8 subjects each

Anx.	Source	Df	Ms	f	P
A	Methods	2	5.4	0.67	n.s
B	Gender	1	0.26	1.1	n.s
AxB		2	17.2	0.71	n.s
EB	error btwn	42	24.4		
C	Repeated	1	52.5	9.7	<.01
AxC		2	2.3	0.42	n.s
BxC		1	6.5	1.2	n.s
	A x B x C	2	3.2	0.59	n.s
EW	error within	42	5.4		

3 way ANOVA, rptd msr, equal n, 1st 8 subjects

Perf	Source	Df	Ms	f	P
A	Methods	2	23	0.38	n.s
B	Gender	1	25	0.42	n.s
AxB		2	40.5	0.67	n.s
EB	error btwn	42	60.3		
C	Repeated	1	894	58.5	<.01
AxC		2	8.8	0.57	n.s
BxC		1	8.8	0.57	n.s
	A x B x C	2	9.7	0.63	n.s
EW	error within	42	15.3		

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